CLAIMS

What is claimed is:

1. A battery having an acid electrolyte and in which oxygen and a dendrite-forming metal form a redox pair, and wherein acidity of the electrolyte is provided at least in part by a compound that reduces dendrite formation during charging.

2. The battery of claim 1 wherein the dendrite-forming metal is zinc.

3. The battery of claim 1 wherein the compound comprises an organic acid.

4. The battery of claim 3 wherein the compound comprises methane sulfonic acid.

5. The battery of claim 3 wherein the compound is selected from the group consisting of polyvinyl sulfonic acid, polyvinyl sulfuric acid, and sulfurous acid.

6. The battery of claim 1 further comprising a zinc brightener.

7. The battery of claim 6 wherein the zinc brightener is selected from the group consisting of an aromatic monocarboxylic acid, an aromatic aldehyde, and a polyhydric alcohol having ethoxylated or propoxylated hydroxyl groups.

8. The battery of claim 1 wherein the dendrite-forming metal forms a complex with the compound when the battery discharges.

9. The battery of claim 8 wherein the dendrite-forming metal is zinc, and wherein the compound comprises methane sulfonic acid.

10. The battery of claim 1 wherein the oxygen is reduced on a cathode when the battery is charged, and wherein the cathode comprises at least one of a Magnelli phase titanium suboxide and glassy carbon.

11. The battery of claim 1 comprising a plurality of cells in which a bipolar electrode separates a first cell from a second cell, and in which at least one side of the bipolar electrode comprises a Magnelli phase titanium suboxide.

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12. A secondary battery having an acid electrolyte and a redox pair comprising zinc and oxygen, and wherein the electrolyte further comprises methane sulfonic acid in an amount effective to reduce dendrite formation.

13. The secondary battery of claim 12 further comprising a separator separating an anolyte from a catholyte, wherein (a) the methane sulfonic acid is protonated in the anolyte and wherein (b) the methane sulfonic acid is deprotonated in the catholyte when the battery is charging.

14. The secondary battery of claim 12 wherein the oxygen is reduced on a cathode when the battery is charged, and wherein the cathode comprises at least one of a Magnelli phase titanium suboxide and glassy carbon.

15. The secondary battery of claim 12 comprising a plurality of cells in which a bipolar electrode separates a first cell from a second cell, and in which at least one side of the bipolar electrode comprises a Magnelli phase titanium suboxide.

16. A secondary battery having a static catholyte and a static acidic anolyte, and in which oxygen and a dendrite-forming metal form a redox pair, wherein at least one of the catholyte and the anolyte includes a dendrite-reducing acid thereby allowing use of the battery through at least 50 cycles at substantially unchanged battery performance.

17. The secondary battery of claim 16 wherein the dendrite-forming metal is zinc.

18. The secondary battery of claim 16 wherein the dendrite-reducing acid is selected from the group consisting of methane sulfonic acid, polyvinyl sulfonic acid, polyvinyl sulfuric acid, and sulfurous acid.

19. The battery of claim 16 wherein the oxygen is reduced on a cathode when the battery is charged, and wherein the cathode comprises at least one of a Magnelli phase titanium suboxide and glassy carbon.

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20. The battery of claim 16 comprising a plurality of cells in which a bipolar electrode separates a first cell from a second cell, and in which at least one side of the bipolar electrode comprises a Magnelli phase titanium suboxide.